

Slide 1-4  
clicker

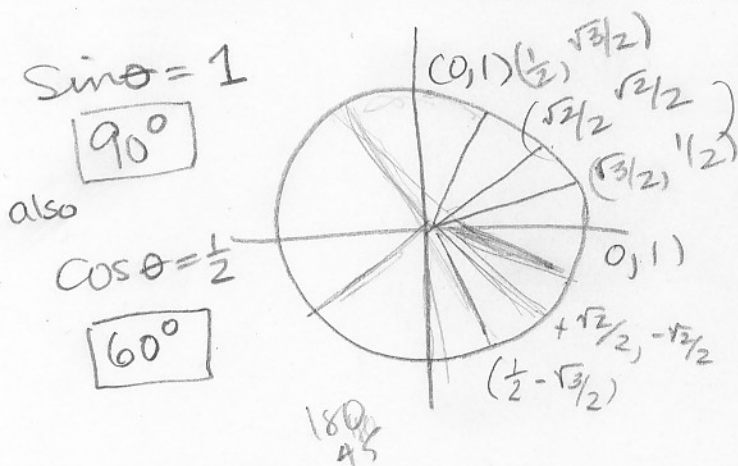
talk about  
periodic  
nature of  
unit circle!  
 $\sin \theta = 1$  @  $90^\circ + 360n$   
 $\cos \theta = \frac{1}{2}$  @  $60^\circ$  &  $300^\circ$   
 $120^\circ$  &  $240^\circ$

Obj: Students will apply trigonometric functions to solve right triangles and word problems.

Some inverse trig functions can be found without a calculator: (answer in degrees)

- 1)  $\sin \theta = 1 \rightarrow \theta = 90^\circ + 360n$
- 2)  $\cos \theta = 0.5 \rightarrow \theta = 60^\circ + 360n$
- 3)  $\tan \theta = 1 \rightarrow \theta = 45^\circ + 180n$
- 4)  $\sec \theta = \sqrt{2} \rightarrow \theta = 45^\circ$

$\cos \theta = \frac{1}{\sqrt{2}}$



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What does it mean to solve a right triangle?

Find the lengths of all 3 sides and find the measures of all 3 angles.

What pieces of information do you need to solve a right triangle?

An angle (besides the 90 degree one) and a side - OR - 2 sides

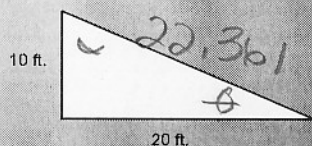
$\sec \theta = \frac{1}{\cos \theta}$

$\tan \theta = 1$   
 $45^\circ, 225^\circ$

$\frac{1}{1/\sqrt{2}} = \sqrt{2}$   
 $\hookrightarrow \frac{1}{\sqrt{2}/2} = 45^\circ$

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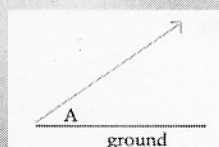
2 Solve the right triangle.



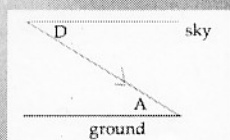
Enter your answer for the angle opposite 10 ft. (In degrees)

Obj: Students will apply trigonometric functions to solve right triangles and word problems.

As a review...



An Angle of Elevation A



An Angle of Depression D  
Then  $D = A$

$H = \sqrt{10^2 + 20^2} = 22.361$

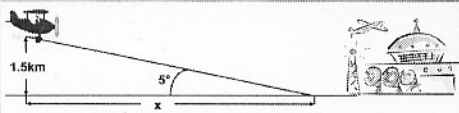
$\tan \theta = \frac{10}{20} \Rightarrow \tan^{-1}(\frac{1}{2}) = 26.569^\circ$

$\tan \alpha = \frac{20}{10} = 63.435^\circ$

repeat problem  
 ↓ skip if you have already done this one  
 ↓ repeat

Obj: Students will apply trigonometric functions to solve right triangles and word problems.

- 3 A plane is flying at an altitude of 1.5km. The pilot wants to descend into an airport so that the path of the plane makes an angle of  $5^\circ$  with the ground. How far from the airport (horizontal distance) should the descent begin?



$$\tan 5^\circ = \frac{1.5 \text{ km}}{x}$$

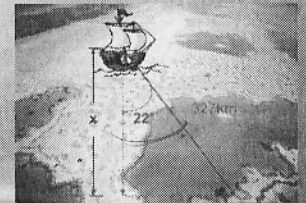
$$x \tan 5^\circ = 1.5$$

$$x = \frac{1.5}{\tan 5^\circ}$$

$$x = 17.145 \text{ km}$$

Obj: Students will apply trigonometric functions to solve right triangles and word problems.

- 4 A ship sailed from a port with a bearing of  $S 22^\circ E$ . How far south has the ship traveled after covering a distance of 327km?



$$\cos 22^\circ = \frac{x}{327}$$

$$327 \cos 22^\circ = x$$

$$x = 303.189 \text{ km}$$

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- 5 A flat 12 foot plank rests with one end on the ground and the other end on a 4 foot ledge.

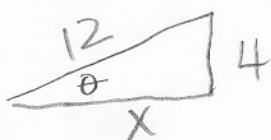


How far from the base of the ledge is the far end of the plank?

What is the grade (i.e., angle of elevation)? (In degrees)

Enter the larger of the two answers.

11.314 ft



$$\sin \theta = \frac{4}{12}$$

$$\sin^{-1} 4/12$$

$$x^2 + 4^2 = 12^2$$

$$x^2 + 16 = 144$$

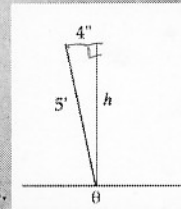
$$x^2 = 128$$

$$11.314 \text{ ft}$$

$$19.471^\circ$$

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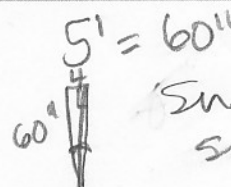
- 6 A 5 ft post is supposed to be vertical, but it is 4 inches out of alignment at the top.



What is the angle of lean?

How high does it reach? (feet)

Enter the larger of the 2 answers.



$$\sin \theta = \frac{4}{60}$$

$$\sin^{-1} (4/60) = 3.823^\circ$$

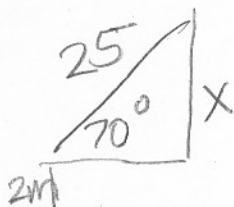
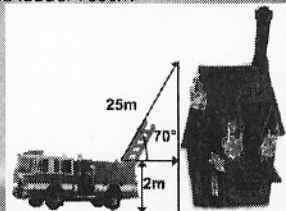
$$4^2 + x^2 = 60^2$$

$$x^2 = 3600 - 16$$

$$x = 59.867 \text{ ft}$$

**Obj: Students will apply trigonometric functions to solve right triangles and word problems.**

- 7 A ladder on a fire truck can be turned to a maximum angle of  $70^\circ$  and can be extended to a maximum length of 25m. If the base of the ladder is mounted on the fire truck 2m above the ground, how high above the ground will the ladder reach?



$$\sin 70^\circ = \frac{X}{25}$$

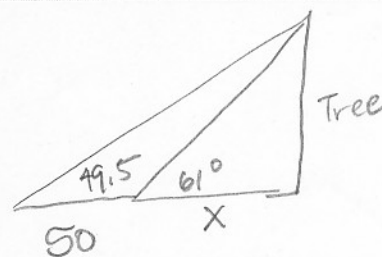
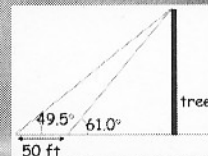
$$25 \sin 70^\circ = 23.492$$

$$+ 2m$$

$$\boxed{25.492m}$$

**Obj: Students will apply trigonometric functions to solve right triangles and word problems.**

- 8 You are hiking along a river and see a tall tree on the opposite bank. You measure the angle of elevation of the top of the tree and find it to be  $61.0^\circ$ . You then walk 50 feet directly away from the tree and measure the angle of elevation. If the second measurement is  $49.5^\circ$ , how tall is the tree?



$$\begin{aligned} \tan 61^\circ &= \frac{T}{X} \\ \tan 49.5^\circ &= \frac{T}{X+50} \end{aligned}$$

$$\begin{aligned} T &= X \tan 61^\circ \\ T &= (X+50) \tan 49.5^\circ \end{aligned}$$

**Obj: Students will apply trigonometric functions to solve right triangles and word problems.**

Your Turn! You work for a text book company, and you have been asked to create a realistic word problem using right triangle trigonometry.

With your group, design a word problem that would be interesting to a high school student. You will be trading with another group, so make sure it would make sense to someone else. Work out the solution separately so you can compare answers when finished.

**Obj: Students will apply trigonometric functions to solve right triangles and word problems.**

### Homework:

Create your own *inverse trig* question (word problem) and post it and the solution to it on the wiki.

$$\begin{aligned} X \tan 61^\circ &= \tan 49.5^\circ (X+50) \\ X \tan 61^\circ &= X \tan 49.5^\circ + 50 \tan 49.5^\circ \\ X \tan 61^\circ - X \tan 49.5^\circ &= 50 \tan 49.5^\circ \\ X (\tan 61^\circ - \tan 49.5^\circ) &= 50 \tan 49.5^\circ \\ X &= \frac{50 \tan 49.5^\circ}{\tan 61^\circ - \tan 49.5^\circ} \end{aligned}$$

$$\boxed{28.868 \text{ ft}}$$

92.343 or 92.342 18 no rounding

$\therefore T \Rightarrow \tan 49.5^\circ = \frac{T}{50 + 28.868}$